SEQUENCE LISTING

<110> Alam, Maqsudul
Larsen, Randy

<120> HEME PROTEINS HEMAT-HS AND HEMAT-BS AND THEIR USE IN MEDICINE AND MICROSENSORS

<130> 201040/1020

<140> 09/455,978
<141> 1999-12-06

<160> 86

<170> PatentIn Ver. 2.1

<210> 1
<211> 1470
<212> DNA
<213> Halobacterium salinarum

<400> 1
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ctgggcctcg ggcgcggcga gtacgacacc gagtacgccg cccagcgcgc ccgtatcggg 360
aagatacacg acgtgctcgg gctcggaccg gacgtctatc tgggcgcgta cacgcgatac 420
tacacggggc tgttggacgc gcttgccgac gacgtggtcg ccgaccgcgg cgaggaggcg 480
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gatcagcaga tcgcaatgga cacctacatc gactcgtacg cccagcgcct ccacgacgag 600
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<210> 2
<211> 489
<212> PRT
<213> Halobacterium salinarum

<400> 2

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Ile Asp Gly His Ala Leu Ala Asp Arg Ile Gly Leu Asp Glu Ala Glu
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Ile Ala Trp Arg Leu Ser Phe Thr Gly Ile Asp Asp Asp Thr Met Ala
         35                  40                  45

Ala Leu Ala Ala Glu Gln Pro Leu Phe Glu Ala Thr Ala Asp Ala Leu
     50                  55                  60

Val Thr Asp Phe Tyr Asp His Leu Glu Ser Tyr Glu Arg Thr Gln Asp
 65                  70                  75                  80

Leu Phe Ala Asn Ser Thr Lys Thr Val Glu Gln Leu Lys Glu Thr Gln
                 85                  90                  95

Ala Glu Tyr Leu Leu Gly Leu Gly Arg Gly Glu Tyr Asp Thr Glu Tyr
            100                 105                 110

Ala Ala Gln Arg Ala Arg Ile Gly Lys Ile His Asp Val Leu Gly Leu
        115                 120                 125

Gly Pro Asp Val Tyr Leu Gly Ala Tyr Thr Arg Tyr Tyr Thr Gly Leu
    130                 135                 140

Leu Asp Ala Leu Ala Asp Asp Val Val Ala Asp Arg Gly Glu Glu Ala
145                 150                 155                 160

Ala Ala Ala Val Asp Glu Leu Val Ala Arg Phe Leu Pro Met Leu Lys
                165                 170                 175

Leu Leu Thr Phe Asp Gln Gln Ile Ala Met Asp Thr Tyr Ile Asp Ser
            180                 185                 190

Tyr Ala Gln Arg Leu His Asp Glu Ile Asp Ser Arg Gln Glu Leu Ala
        195                 200                 205

Asn Ala Val Ala Thr His Val Glu Ala Pro Leu Ser Ser Leu Glu Ala
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Thr Ser Gln Asp Val Ala Glu Arg Thr Asp Thr Met Arg Ala Arg Thr
225                 230                 235                 240

Asp Asp Gln Val Asp Arg Met Ala Asp Val Ser Arg Glu Ile Ser Ser
                245                 250                 255

Val Ser Ala Ser Val Glu Glu Val Ala Ser Thr Ala Asp Asp Val Arg
            260                 265                 270

Arg Thr Ser Glu Asp Ala Glu Ala Leu Ala Gln Gln Gly Glu Ala Ala
        275                 280                 285

Ala Asp Asp Ala Leu Ala Thr Met Thr Asp Ile Asp Glu Ala Thr Asp
    290                 295                 300

Gly Val Thr Ala Gly Val Glu Gln Leu Gly Glu Arg Ala Ala Asp Val
305                 310                 315                 320

Glu Ser Val Thr Gly Val Ile Asp Asp Ile Ala Glu Gln Thr Asn Met
                325                 330                 335

Leu Ala Leu Asn Ala Ser Ile Glu Ala Ala Arg Ala Gly Glu Ala Gly
            340                 345                 350

Glu Gly Phe Ala Val Val Ala Asp Glu Val Lys Ala Leu Ala Glu Glu
        355                 360                 365

Ser Arg Glu Gln Ser Thr Arg Val Glu Glu Leu Val Glu Gln Met Gln
    370                 375                 380

Ala Glu Thr Glu Glu Thr Val Asp Gln Leu Asp Glu Val Asn Gln Arg
385                 390                 395                 400

Ile Gly Glu Gly Val Glu Arg Val Glu Glu Ala Met Glu Thr Leu Gln
                405                 410                 415

Glu Ile Thr Asp Ala Val Glu Asp Ala Ala Ser Gly Met Gln Glu Val
            420                 425                 430

Ser Thr Ala Thr Asp Glu Gln Ala Val Ser Thr Glu Glu Val Ala Glu
        435                 440                 445

Met Val Asp Gly Val Asp Asp Arg Ala Gly Glu Ile Ala Ala Ala Leu
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Asp Asp Ile Ala Asp Ala Thr Asp Gln Gln Val Arg Thr Val Glu Glu
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465 470 475 480

Val Arg Glu Thr Val Gly Lys Leu Ser
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<210> 3
<211> 1390
<212> DNA
<213> Bacillus subtilis

<400> 3
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gtcaggttgg gagatgctga gctttatgtg ttagagcagc ttcagccact cattcaagaa 180
aatatcgtaa atatcgtcga tgcgttttat aaaaaccttg accatgaaag ctcattgatg 240
gatatcatta atgatcacag ctcagttgac cgcttaaaac aaacgttaaa acggcatatt 300
caggaaatgt ttgcaggcgt tatcgatgat gaatttattg aaaagcgtaa ccgaatcgcc 360
tccatccatt taagaatcgg ccttttgcca aaatggtata tgggtgcgtt tcaagagctc 420
cttttgtcaa tgattgacat ttatgaagcg tccattacaa atcagcaaga actgctaaaa 480
gccattaaag caacaacaaa aatcttgaac ttagaacagc agcttgtcct tgaagcgttt 540
caaagcgagt acaaccagac ccgtgatgaa caagaagaaa agaaaaacct tcttcatcag 600
aaaattcaag aaacctctgg atcgattgcc attctgtttt cagaaacaag cagatcagtt 660
caagagcttg tggacaaatc tgaaggcatt tctcaagcat ccaaagccgg cactgtaaca 720
tccagcactg ttgaagaaaa gtcgatcggc ggaaaaaaag agctagaagt ccagcaaaaa 780
cagatgaaca aaattgacac aagccttgtc caaatcgaaa aagaaatggt caagctggat 840
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<210> 4
<211> 432
<212> PRT
<213> Bacillus subtilis

<400> 4
Met Leu Phe Lys Lys Asp Arg Lys Gln Glu Thr Ala Tyr Phe Ser Asp
1 5 10 15

Ser Asn Gly Gln Gln Lys Asn Arg Ile Gln Leu Thr Asn Lys His Ala

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                20                  25                  30

Asp Val Lys Lys Gln Leu Lys Met Val Arg Leu Gly Asp Ala Glu Leu
          35                  40                  45

Tyr Val Leu Glu Gln Leu Gln Pro Leu Ile Gln Glu Asn Ile Val Asn
      50                  55                  60

Ile Val Asp Ala Phe Tyr Lys Asn Leu Asp His Glu Ser Ser Leu Met
 65                  70                  75                  80

Asp Ile Ile Asn Asp His Ser Ser Val Asp Arg Leu Lys Gln Thr Leu
                 85                  90                  95

Lys Arg His Ile Gln Glu Met Phe Ala Gly Val Ile Asp Asp Glu Phe
            100                 105                 110

Ile Glu Lys Arg Asn Arg Ile Ala Ser Ile His Leu Arg Ile Gly Leu
        115                 120                 125

Leu Pro Lys Trp Tyr Met Gly Ala Phe Gln Glu Leu Leu Leu Ser Met
    130                 135                 140

Ile Asp Ile Tyr Glu Ala Ser Ile Thr Asn Gln Gln Glu Leu Leu Lys
145                 150                 155                 160

Ala Ile Lys Ala Thr Thr Lys Ile Leu Asn Leu Glu Gln Gln Leu Val
                165                 170                 175

Leu Glu Ala Phe Gln Ser Glu Tyr Asn Gln Thr Arg Asp Glu Gln Glu
            180                 185                 190

Glu Lys Lys Asn Leu Leu His Gln Lys Ile Gln Glu Thr Ser Gly Ser
        195                 200                 205

Ile Ala Asn Leu Phe Ser Glu Thr Ser Arg Ser Val Gln Glu Leu Val
    210                 215                 220

Asp Lys Ser Glu Gly Ile Ser Gln Ala Ser Lys Ala Gly Thr Val Thr
225                 230                 235                 240

Ser Ser Thr Val Glu Glu Lys Ser Ile Gly Gly Lys Lys Glu Leu Glu
                245                 250                 255

Val Gln Gln Lys Gln Met Asn Lys Ile Asp Thr Ser Leu Val Gln Ile
            260                 265                 270

Glu Lys Glu Met Val Lys Leu Asp Glu Ile Ala Gln Gln Ile Glu Lys
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275 280 285

Ile Phe Gly Ile Val Thr Gly Ile Ala Glu Gln Thr Asn Leu Leu Ser
290 295 300

Leu Asn Ala Ser Ile Glu Ser Ala Arg Ala Gly Glu His Gly Lys Gly
305 310 315 320

Phe Ala Val Val Ala Asn Glu Val Arg Lys Leu Ser Glu Asp Thr Lys
325 330 335

Lys Thr Val Ser Thr Val Ser Glu Leu Val Asn Asn Thr Asn Thr Gln
340 345 350

Ile Asn Ile Val Ser Lys His Ile Lys Asp Val Asn Glu Leu Val Ser
355 360 365

Glu Ser Lys Glu Lys Met Thr Gln Ile Asn Arg Leu Phe Asp Glu Ile
370 375 380

Val His Ser Met Lys Ile Ser Lys Glu Gln Ser Gly Lys Ile Asp Val
385 390 395 400

Asp Leu Gln Ala Phe Leu Gly Gly Leu Gln Glu Val Ser Arg Ala Val
405 410 415

Ser His Val Ala Ala Ser Val Asp Ser Leu Val Ile Leu Thr Glu Glu
420 425 430

<210> 5
<211> 57
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Template sequence

<220>
<221> UNSURE
<222> (4)..(57)
<223> Xaa at positions 4, 10, 14, 15, 27, and 41-57 is unknown

<400> 5
Ile Ile Lys Xaa Thr Val Pro Val Leu Xaa Glu His Gly Xaa Xaa Ile
1 5 10 15

Gly Gln Asp Val Leu Val Val Leu Ile Lys Xaa Asn Pro Glu Ile Gln
20 25 30

Glu Lys Phe Phe Phe Phe Lys His Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
50 55

<210> 6
<211> 55
<212> PRT
<213> Erwinia chrysanthemi

<400> 6
Ile Lys Ser Thr Ile Pro Leu Leu Ala Glu Thr Gly Pro Ala Leu Thr
1 5 10 15

Ala His Phe Tyr Gln Arg Met Phe His His Asn Pro Glu Leu Lys Asp
20 25 30

Ile Phe Asn Met Ser Asn Gln Arg Asn Gly Asp Gln Arg Glu Ala Leu
35 40 45

Phe Asn Ala Ile Cys Ala Tyr
50 55

<210> 7
<211> 56
<212> PRT
<213> Vitreoscilla stercoraria

<400> 7
Ile Ile Lys Ala Thr Val Pro Val Leu Lys Glu His Gly Val Thr Ile
1 5 10 15

Thr Thr Thr Phe Tyr Lys Asn Leu Phe Ala Lys His Pro Glu Val Arg
20 25 30

Pro Leu Phe Asp Met Gly Arg Gln Glu Ser Leu Glu Gln Pro Lys Ala
35 40 45

Leu Ala Met Thr Val Leu Ala Ala
50 55

<210> 8
<211> 55
<212> PRT
<213> Escherichia coli

<400> 8
Val Lys Ala Thr Ile Pro Leu Leu Val Glu Thr Gly Pro Lys Leu Thr
1 5 10 15

Ala His Phe Tyr Asp Arg Met Phe Thr His Asn Pro Glu Leu Lys Glu
20 25 30

Ile Phe Asn Met Ser Asn Gln Arg Asn Gly Asp Gln Arg Glu Ala Leu
35 40 45

Phe Asn Ala Ile Ala Ala Tyr
50 55

<210> 9
<211> 55
<212> PRT
<213> Salmonella typhimurium

<400> 9
Val Lys Ala Thr Ile Pro Leu Leu Val Glu Thr Gly Pro Lys Leu Thr
1 5 10 15

Ala His Phe Tyr Asp Arg Met Phe Thr His Asn Pro Glu Leu Lys Glu
20 25 30

Ile Phe Asn Met Ser Asn Gln Arg Asn Gly Asp Gln Arg Glu Ala Leu
35 40 45

Phe Asn Ala Ile Ala Ala Tyr
50 55

<210> 10
<211> 56
<212> PRT
<213> Ralstonia eutropha

<400> 10

Ile Val Lys Ala Thr Ala Pro Val Leu Ala Glu His Gly Tyr Asp Ile
1 5 10 15

Ile Lys Cys Phe Tyr Gln Arg Met Phe Glu Ala His Pro Glu Leu Lys
20 25 30

Asn Val Phe Asn Met Ala His Gln Glu Gln Gly Gln Gln Gln Gln Ala
35 40 45

Leu Ala Arg Ala Val Tyr Ala Tyr
50 55

<210> 11
<211> 56
<212> PRT
<213> Vibrio parahaemolyticus

<400> 11
Ile Val Lys Ala Thr Ala Pro Leu Ile Ala Glu Thr Gly Pro Lys Leu
1 5 10 15

Thr Ala His Phe Tyr Asp Arg Met Phe Thr His Asn Pro Glu Leu Lys
20 25 30

Asp Ile Phe Asn Met Ser Asn Gln Arg Asn Gly Asp Gln Arg Glu Ala
35 40 45

Leu Phe Asn Ala Ile Cys Ala Tyr
50 55

<210> 12
<211> 56
<212> PRT
<213> Clostridium perfringens

<400> 12
Ile Ile Lys Ser Thr Val Pro Val Leu Lys Ser Asn Gly Leu Glu Ile
1 5 10 15

Thr Lys Thr Phe Tyr Lys Asn Met Phe Glu Gln Asn Pro Glu Val Lys
20 25 30

Pro Leu Phe Asn Met Asn Lys Gln Glu Ser Glu Glu Gln Pro Lys Ala
35 40 45

Leu Ala Met Ala Ile Leu Ala Val

50 55

<210> 13
<211> 56
<212> PRT
<213> Fusarium oxysporum

<400> 13
Ile Val Lys Ser Thr Ala Pro Ile Leu Lys Glu His Gly Lys Thr Ile
1 5 10 15

Thr Thr Thr Phe Tyr Arg Asn Met Leu Gly Ala His Pro Glu Leu Lys
20 25 30

Asn Tyr Phe Ser Leu Arg Asn Gln Gln Thr Gly Ala Gln Gln Ala Ala
35 40 45

Leu Ala Asn Ser Val Leu Ala Tyr
50 55

<210> 14
<211> 53
<212> PRT
<213> Aquifex aeolicus

<400> 14
Val Ile Lys Ser Thr Val Pro Leu Leu Lys Glu His Gly Thr Glu Ile
1 5 10 15

Thr Ala Arg Met Tyr Glu Leu Leu Phe Ser Lys Tyr Pro Lys Thr Lys
20 25 30

Glu Leu Phe Ala Gly Ala Ser Glu Glu Gln Pro Lys Lys Leu Ala Asn
35 40 45

Ala Ile Ile Ala Tyr
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<210> 15
<211> 56
<212> PRT
<213> Bacillus subtilis

<400> 15
Ile Ile Lys Ser Thr Val Pro Val Leu Gln Gln His Gly Glu Thr Ile

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  1               5                  10                  15

Thr Gly Arg Phe Tyr Asp Arg Met Phe Gln Asp His Pro Glu Leu Leu
             20                  25                  30

Asn Ile Phe Asn Gln Thr Asn Gln Lys Lys Lys Thr Gln Arg Thr Ala
         35                  40                  45

Leu Ala Asn Ala Val Ile Ala Ala
     50                  55
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<210> 16
<211> 56
<212> PRT
<213> Xenopus laevis

<400> 16

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Ile Lys Ala Ile Met Pro Ser Ile Ala Ala His Gly Asp Thr Phe Gly
  1               5                  10                  15

Gly Glu Ala Leu Tyr Arg Met Phe Leu Val Asn Pro Lys Thr Lys Thr
             20                  25                  30

Tyr Phe Pro Ser Phe Asp Phe His His Asn Ser Lys Gln Ile Thr Ser
         35                  40                  45

His Gly Lys Lys Val Val Asp Ala
     50                  55
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<210> 17
<211> 57
<212> PRT
<213> Chironomus thummi

<400> 17

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Asp Gln Leu Ala Leu Phe Lys Ser Ser Trp Asn Thr Val Lys His Asn
  1               5                  10                  15

Glu Val Asp Ile Leu Tyr Ala Val Phe Lys Ala Asn Pro Asp Ile Gln
             20                  25                  30

Ala Lys Phe Pro Gln Phe Ala Gly Lys Asp Leu Asp Ser Ile Lys Asp
         35                  40                  45

Ser Ala Asp Phe Ala Val His Ser Gly
     50                  55
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<210> 18
<211> 56
<212> PRT
<213> Xenopus borealis

<400> 18
Ile Lys Ala Ile Met Pro Ser Ile Ala Ala His Gly Asp Lys Phe Gly
1 5 10 15

Gly Glu Ala Leu Tyr Arg Met Phe Leu Val Asn Pro Lys Thr Lys Thr
20 25 30

Tyr Phe Pro Thr Phe Asp Phe His His Asn Ser Lys Gln Ile Ser Ala
35 40 45

His Gly Lys Lys Val Val Asp Ala
50 55

<210> 19
<211> 56
<212> PRT
<213> Xenopus borealis

<400> 19
Ile Lys Ala Ile Leu Pro Ser Ile Ala Ala His Gly Asp Lys Phe Gly
1 5 10 15

Gly Glu Ala Leu Tyr Arg Met Phe Leu Ile Asn Pro Lys Thr Lys Thr
20 25 30

Tyr Phe Pro Asn Phe Asp Phe His His Asn Ser Lys Gln Ile Ser Ala
35 40 45

His Gly Lys Lys Val Val Asp Ala
50 55

<210> 20
<211> 57
<212> PRT
<213> Chironomus thummi

<400> 20
Gln Ala Ile Leu Ile Arg Ser Ser Trp Glu Asp Glu Val Lys His Asn
1 5 10 15

Glu Val Asp Ile Leu Tyr Ala Ile Phe Lys Ala Asn Pro Asp Ile Gln
20 25 30

Ala Arg Phe Pro Gln Phe Ala Gly Lys Asp Leu Asp Ser Ile Lys Thr
35 40 45

Thr Gly Gln Phe Ala Val His Ala Gly
50 55

<210> 21
<211> 55
<212> PRT
<213> Pichia norvegensis

<400> 21
Leu Gln Ser Leu Ala Pro Val Val Lys Glu His Gly Val Thr Val Thr
1 5 10 15

Ser Thr Met Tyr Lys Tyr Met Phe Gln Thr Tyr Pro Glu Val Arg Ser
20 25 30

Tyr Phe Asn Met Thr Asn Gln Lys Thr Gly Arg Gln Pro Lys Val Leu
35 40 45

Ala Phe Ser Leu Tyr Gln Tyr
50 55

<210> 22
<211> 56
<212> PRT
<213> Saccharomyces cerevisiae

<400> 22
Ile Ile Lys Ala Thr Val Pro Val Leu Glu Gln Gln Gly Thr Val Ile
1 5 10 15

Thr Arg Thr Phe Tyr Lys Asn Met Leu Thr Glu His Thr Glu Leu Leu
20 25 30

Asn Ile Phe Asn Arg Thr Asn Gln Lys Val Gly Ala Gln Pro Asn Ala
35 40 45

Leu Ala Thr Thr Val Leu Ala Ala
50 55

<210> 23
<211> 41
<212> PRT
<213> Physeter catodon

<400> 23
Gly Gln Asp Ile Leu Ile Arg Leu Phe Lys Ser His Pro Glu Thr Leu
1 5 10 15

Glu Lys Phe Asp Arg Phe Lys His Leu Lys Thr Glu Ala Glu Met Lys
20 25 30

Ala Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 24
<211> 41
<212> PRT
<213> Kogia simus

<400> 24
Gly Gln Asp Ile Leu Ile Arg Leu Phe Lys His His Pro Glu Thr Leu
1 5 10 15

Glu Lys Phe Asp Arg Phe Lys His Leu Lys Ser Glu Ala Glu Met Lys
20 25 30

Ala Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 25
<211> 41
<212> PRT
<213> Rousettus aegyptiacus

<400> 25
Gly Gln Glu Val Leu Ile Arg Leu Phe Lys Gly His Pro Glu Thr Leu
1 5 10 15

Glu Lys Phe Asp Lys Phe Lys His Leu Lys Ser Glu Asp Glu Met Lys
20 25 30

Ala Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 26
<211> 41
<212> PRT
<213> Delphinus delphis

<400> 26
Gly Gln Asp Val Leu Ile Arg Leu Phe Lys Gly His Pro Glu Thr Leu
1 5 10 15

Glu Lys Phe Asp Lys Phe Lys His Leu Lys Thr Glu Ala Asp Met Lys
20 25 30

Ala Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 27
<211> 41
<212> PRT
<213> Globicephala melas

<400> 27
Gly Gln Asp Ile Leu Ile Arg Leu Phe Lys Gly His Pro Glu Thr Leu
1 5 10 15

Glu Lys Phe Asp Lys Phe Lys His Leu Lys Thr Glu Ala Asp Met Lys
20 25 30

Ala Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 28
<211> 41
<212> PRT
<213> Aethia pygmaea

<400> 28
Gly His Gln Val Leu Met Arg Leu Phe Gln Asp His Pro Glu Thr Leu
1 5 10 15

Asp Arg Phe Asp Lys Phe Lys Gly Leu Lys Thr Pro Asp Gln Met Lys
20 25 30

Gly Ser Glu Asp Leu Lys Lys His Gly
35 40

<210> 29
<211> 39
<212> PRT
<213> Mustelus antarcticus

<400> 29
Gly Gln Asn Ile Leu Leu Arg Leu Phe Glu Gln Tyr Pro Glu Ser Gln
1 5 10 15

Asn His Phe Pro Lys Phe Lys Asn Lys Ser Leu Gly Glu Leu Lys Asp
20 25 30

Thr Ala Asp Ile Lys Ala Gln
35

<210> 30
<211> 39
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Template sequence

<220>
<221> UNSURE
<222> (1)..(18)
<223> Xaa at positions 1-18, 22, and 30 is unknown

<400> 30
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1 5 10 15

Xaa Xaa Ala Gln Arg Xaa Arg Leu Ala Gln Ile His Ala Xaa Lys Gly
20 25 30

Lys Ile Pro Asp Trp Tyr Leu
35

<210> 31
<211> 39
<212> PRT
<213> Physeter catodon

<400> 31

Val Thr Val Leu Thr Ala Leu Gly Ala Ile Leu Lys Lys Lys Gly His
1 5 10 15

His Glu Ala Glu Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys His
20 25 30

Lys Ile Pro Ile Lys Tyr Leu
35

<210> 32
<211> 39
<212> PRT
<213> Kogia simus

<400> 32
Val Thr Val Leu Thr Ala Leu Gly Ala Ile Leu Lys Lys Lys Gly His
1 5 10 15

His Glu Ala Glu Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys His
20 25 30

Lys Ile Pro Ile Lys Tyr Leu
35

<210> 33
<211> 39
<212> PRT
<213> Rousettus aegyptiacus

<400> 33
Ala Thr Val Leu Thr Ala Leu Gly Gly Ile Leu Lys Lys Lys Gly Gln
1 5 10 15

His Glu Ala Gln Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys His
20 25 30

Lys Ile Pro Val Lys Tyr Leu
35

<210> 34
<211> 39
<212> PRT
<213> Delphinus delphis

<400> 34

Asn Thr Val Leu Thr Ala Leu Gly Ala Ile Leu Lys Lys Lys Gly His
1 5 10 15

His Asp Ala Glu Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys His
20 25 30

Lys Ile Pro Ile Lys Tyr Leu
35

<210> 35
<211> 39
<212> PRT
<213> Globicephala melas

<400> 35
Asn Thr Val Leu Thr Ala Leu Gly Ala Ile Leu Lys Lys Lys Gly His
1 5 10 15

His Glu Ala Glu Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys His
20 25 30

Lys Ile Pro Ile Lys Tyr Leu
35

<210> 36
<211> 39
<212> PRT
<213> Aethia pygmaea

<400> 36
Val Thr Val Leu Thr Gln Leu Gly Lys Ile Leu Lys Gln Lys Gly Asn
1 5 10 15

His Glu Ser Glu Leu Lys Pro Leu Ala Gln Thr His Ala Thr Lys His
20 25 30

Lys Ile Pro Val Lys Tyr Leu
35

<210> 37
<211> 39
<212> PRT
<213> Bacillus subtilis

<400> 37

Leu Lys Arg His Ile Gln Glu Met Phe Ala Gly Val Ile Asp Asp Glu
1 5 10 15

Phe Ile Glu Lys Arg Asn Arg Ile Ala Ser Ile His Leu Arg Ile Gly
20 25 30

Leu Leu Pro Lys Trp Tyr Met
35

<210> 38
<211> 40
<212> PRT
<213> Mustelus antarcticus

<400> 38
Ala Asp Thr Val Leu Ser Ala Leu Gly Asn Ile Val Lys Lys Lys Gly
1 5 10 15

Ser His Ser Gln Pro Val Lys Ala Leu Ala Ala Thr His Ile Thr Thr
20 25 30

His Lys Ile Pro Pro His Tyr Phe
35 40

<210> 39
<211> 39
<212> PRT
<213> Halobacterium salinarum

<400> 39
Gln Ala Glu Tyr Leu Leu Gly Leu Gly Arg Gly Glu Tyr Asp Thr Glu
1 5 10 15

Tyr Ala Ala Gln Arg Ala Arg Ile Gly Lys Ile His Asp Val Leu Gly
20 25 30

Leu Gly Pro Asp Val Tyr Leu
35

<210> 40
<211> 29
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Cloning primer

<400> 40
ccgaattcca tatgagcaac gataatgac 29

<210> 41
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<220>
<221> unsure
<222> (13)..(14)
<223> n at positions 13 and 14 is unknown

<400> 41
cctctagagg atnnctagct gagcttgccg acc 33

<210> 42
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<220>
<221> unsure
<222> (29)
<223> n at position 29 is unknown

<400> 42
tatgggatcc cttgttcatc acgggtctnt tgg 33

<210> 43
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 43
gataaagctt gatcatagct cagttgaccg 30

<210> 44
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 44
tgctgaattc gcagctttca ttcatgtttc cc 32

<210> 45
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 45
ttagggatcc gtcaactgat ttttaattta agttac 36

<210> 46
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 46
atatggatcc aaggggatc attgtaatgt tatttaaaaa ag 42

<210> 47

<211> 46
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 47
attactgcag caactgattt ttaatttaag tttacataat gaacgc 46

<210> 48
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 48
ccgaattcca tatgagcaac gataatgac 29

<210> 49
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 49
ctctagagga tccctagtcg tcggcaagcg cgtcc 35

<210> 50
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<220>

<221> unsure
<222> (15)
<223> n at position 15 is unknown

<400> 50
cctctagagg atccntagac gtcagccatg cggtc 35

<210> 51
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 51
cctctagagg atccctaggc gacgtcctgc gaggtcgcc 39

<210> 52
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 52
cctctagagg atccctacgc gttcgccaac tcctggcggc 40

<210> 53
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 53
cctctagagg atccctagat gtaggtgtcc attgcgatc 39

<210> 54

<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 54
cctctagagg atccctaccg ggccacgagt tcgtcgac 38

<210> 55
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 55
cctctagagg atccctactg gcggctgtcg atctcgtc 38

<210> 56
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 56
cctctagagg atccctactc gtcgtggagg cgctgggc 38

<210> 57
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 57

cctctagagg atccctactg ggcgtacgag tcgatgtag 39

<210> 58
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 58
cctctagagg atccctaggc gtacgagtcg atgtaggtgt cc 42

<210> 59
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 59
cctctagagg atccctagta cgagtcgatg taggtgtcc 39

<210> 60
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 60
cctctagagg atccctacga gtcgatgtag gtgtccattg cg 42

<210> 61
<211> 39
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Cloning primer

<400> 61
cctctagagg atccctagtc gatgtaggtg tccattgcg 39

<210> 62
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 62
ccgaattcca tatgagcaac gataatgac 29

<210> 63
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 63
cctctagact agctgagctt gccgacc 27

<210> 64
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 64
ggaacgggat cgacggggcc gcactcgcgg accgg 35

<210> 65
<211> 35

<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 65
ccggtccgcg agtgcggccc cgtcgatccc gttcc 35

<210> 66
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 66
gaccgacttc tacgacgcct tggagtccta cgagcg 36

<210> 67
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 67
cgctcgtagg actccaaggc gtcgtagaag tcggtc 36

<210> 68
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 68
ccgtatcggg aagatagccg acgtgctcgg gctcg 35

<210> 69
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 69
cgagcccgag cacgtcggct atcttcccga tacgg 35

<210> 70
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 70
cgtacgccca gcgcctcgcc gacgagatcg acagcc 36

<210> 71
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 71
ggctgtcgat ctcgtcggcg aggcgctggg cgtacg 36

<210> 72
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning

primer

<400> 72
gcgaacgcgg tcgccacggc cgtggaagca ccgctg 36

<210> 73
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<220>
<221> unsure
<222> (23)
<223> Y at position 23 in this sequence is either t or c

<400> 73
cagcggtgct tccacggccg tcygcgaccg cgttcgc 37

<210> 74
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 74
atatggatcc aaggggggatc attgtaatgt tatttaaaaa ag 42

<210> 75
<211> 46
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Cloning primer

<400> 75
attactgcag caactgattt ttaatttaag tttacataat gaacgc 46

<210> 76
<211> 153
<212> PRT
<213> Sperm-whale myoglobin

<400> 76
Val Leu Ser Glu Gly Glu Trp Gln Leu Val Leu His Val Trp Ala Lys
1 5 10 15

Val Glu Ala Asp Val Ala Gly His Gly Gln Asp Ile Leu Ile Arg Leu
20 25 30

Phe Lys Ser His Pro Glu Thr Leu Glu Lys Phe Asp Arg Phe Lys His
35 40 45

Leu Lys Thr Glu Ala Glu Met Lys Ala Ser Glu Asp Leu Lys Lys His
50 55 60

Gly Val Thr Val Leu Thr Ala Leu Gly Ala Ile Leu Lys Lys Lys Gly
65 70 75 80

His His Glu Ala Glu Leu Lys Pro Leu Ala Gln Ser His Ala Thr Lys
85 90 95

His Lys Ile Pro Ile Lys Tyr Leu Glu Phe Ile Ser Glu Ala Ile Ile
100 105 110

His Val Leu His Ser Arg His Pro Gly Asp Phe Gly Ala Asp Ala Gln
115 120 125

Gly Ala Met Asn Lys Ala Leu Glu Leu Phe Arg Lys Asp Ile Ala Ala
130 135 140

Lys Tyr Lys Glu Leu Gly Tyr Gln Gly
145 150

<210> 77
<211> 184
<212> PRT
<213> Halobacterium salinarum

<400> 77
Met Ser Asn Asp Asn Asp Thr Leu Val Thr Ala Asp Val Arg Asn Gly
1 5 10 15

```
Ile Asp Gly His Ala Leu Ala Asp Arg Ile Gly Leu Asp Glu Ala Glu
             20                  25                  30

Ile Ala Trp Arg Leu Ser Phe Thr Gly Ile Asp Asp Asp Thr Met Ala
         35                  40                  45

Ala Leu Ala Ala Glu Gln Pro Leu Phe Glu Ala Thr Ala Asp Ala Leu
     50                  55                  60

Val Thr Asp Phe Tyr Asp His Leu Glu Ser Tyr Glu Arg Thr Gln Asp
 65                  70                  75                  80

Leu Phe Ala Asn Ser Thr Lys Thr Val Glu Gln Leu Lys Glu Thr Gln
                 85                  90                  95

Ala Glu Tyr Leu Leu Gly Leu Gly Arg Gly Glu Tyr Asp Thr Glu Tyr
            100                 105                 110

Ala Ala Gln Arg Ala Arg Ile Gly Lys Ile His Asp Val Leu Gly Leu
        115                 120                 125

Gly Pro Asp Val Tyr Leu Gly Ala Tyr Thr Arg Tyr Tyr Thr Gly Leu
    130                 135                 140

Leu Asp Ala Leu Ala Asp Asp Val Val Ala Asp Arg Gly Glu Glu Ala
145                 150                 155                 160

Ala Ala Ala Val Asp Glu Leu Val Ala Arg Phe Leu Pro Met Leu Lys
                165                 170                 175

Leu Leu Thr Phe Asp Gln Gln Ile
            180
```

<210> 78
<211> 175
<212> PRT
<213> Bacillus subtilis

<400> 78

```
Leu Leu Phe Lys Lys Asp Arg Lys Gln Glu Thr Ala Tyr Phe Ser Asp
  1               5                  10                  15

Ser Asn Gly Gln Gln Lys Asn Arg Ile Gln Leu Thr Asn Lys His Ala
             20                  25                  30

Asp Val Lys Lys Gln Leu Lys Met Val Arg Leu Gly Asp Ala Glu Leu
         35                  40                  45
```

```
Tyr Val Leu Glu Gln Leu Gln Pro Leu Ile Gln Glu Asn Ile Val Asn
     50                  55                  60

Ile Val Asp Ala Phe Tyr Lys Asn Leu Asp His Glu Ser Ser Leu Met
 65                  70                  75                  80

Asp Ile Ile Asn Asp His Ser Ser Val Asp Arg Leu Lys Gln Thr Leu
                 85                  90                  95

Lys Arg His Ile Gln Glu Met Phe Ala Gly Val Ile Asp Asp Glu Phe
            100                 105                 110

Ile Glu Lys Arg Asn Arg Ile Ala Ser Ile His Leu Arg Ile Gly Leu
        115                 120                 125

Leu Pro Lys Trp Tyr Met Gly Ala Phe Gln Glu Leu Leu Leu Ser Met
    130                 135                 140

Ile Asp Ile Tyr Glu Ala Ser Ile Thr Asn Gln Gln Glu Leu Leu Lys
145                 150                 155                 160

Ala Ile Lys Ala Thr Thr Lys Ile Leu Asn Leu Glu Gln Gln Leu
                165                 170                 175
```

<210> 79
<211> 274
<212> PRT
<213> Escherichia coli

<400> 79

```
Leu Met Arg Thr Val Gly Asp Val Arg Asn Gly Ala Asn Ala Ile Tyr
  1               5                  10                  15

Ser Gly Ala Ser Glu Ile Ala Thr Gly Asn Asn Asp Leu Ser Ser Arg
             20                  25                  30

Thr Glu Gln Gln Ala Ala Ser Leu Glu Glu Thr Ala Ala Ser Met Glu
         35                  40                  45

Gln Leu Thr Ala Thr Val Lys Gln Asn Ala Glu Asn Ala Arg Gln Ala
     50                  55                  60

Ser His Leu Ala Leu Ser Ala Ser Glu Thr Ala Gln Arg Gly Gly Lys
 65                  70                  75                  80

Val Val Asp Asn Val Val Gln Thr Met Arg Asp Ile Ser Thr Ser Ser
```

```
                85                  90                  95

Gln Lys Ile Ala Asp Ile Ile Ser Val Ile Asp Gly Ile Ala Phe Gln
            100                 105                 110

Thr Asn Ile Leu Ala Leu Asn Ala Ala Val Glu Ala Ala Arg Ala Gly
        115                 120                 125

Glu Gln Gly Arg Gly Phe Ala Val Val Ala Gly Glu Val Arg Asn Leu
    130                 135                 140

Ala Gln Arg Ser Ala Gln Ala Ala Arg Glu Ile Lys Ser Leu Ile Glu
145                 150                 155                 160

Asp Ser Val Gly Lys Val Asp Val Gly Ser Thr Leu Val Glu Ser Ala
                165                 170                 175

Gly Glu Thr Met Ala Glu Ile Val Ser Ala Val Thr Arg Val Thr Asp
            180                 185                 190

Ile Met Gly Glu Ile Ala Ser Ala Ser Asp Glu Gln Ser Arg Gly Ile
        195                 200                 205

Asp Gln Val Gly Leu Ala Val Ala Glu Met Asp Arg Val Thr Gln Gln
    210                 215                 220

Asn Ala Ala Leu Val Glu Glu Ser Ala Ala Ala Ala Ala Ala Leu Glu
225                 230                 235                 240

Glu Gln Ala Ser Arg Leu Thr Glu Ala Val Ala Val Phe Arg Ile Gln
                245                 250                 255

Gln Gln Gln Arg Glu Thr Ser Ala Val Val Lys Thr Val Thr Pro Ala
            260                 265                 270

Ala Pro
```

<210> 80
<211> 268
<212> PRT
<213> Halobacterium salinarum

<400> 80

```
Leu Glu Ala Thr Ser Gln Asp Val Ala Glu Arg Thr Asp Thr Met Arg
  1               5                  10                  15
```

```
Ala Arg Thr Asp Asp Gln Val Asp Arg Met Ala Asp Val Ser Arg Glu
             20                  25                  30

Ile Ser Ser Val Ser Ala Ser Val Glu Glu Val Ala Ser Thr Ala Asp
         35                  40                  45

Asp Val Arg Arg Thr Ser Glu Asp Ala Glu Ala Leu Ala Gln Gln Gly
     50                  55                  60

Glu Ala Ala Ala Asp Asp Ala Leu Ala Thr Met Thr Asp Ile Asp Glu
 65                  70                  75                  80

Ala Thr Asp Gly Val Thr Ala Gly Val Glu Gln Leu Gly Glu Arg Ala
                 85                  90                  95

Ala Asp Val Glu Ser Val Thr Gly Val Ile Asp Asp Ile Ala Glu Gln
            100                 105                 110

Thr Asn Met Leu Ala Leu Asn Ala Ser Ile Glu Ala Ala Arg Ala Gly
        115                 120                 125

Glu Ala Gly Glu Gly Phe Ala Val Val Ala Asp Glu Val Lys Ala Leu
    130                 135                 140

Ala Glu Glu Ser Arg Glu Gln Ser Thr Arg Val Glu Glu Leu Val Glu
145                 150                 155                 160

Gln Met Gln Ala Glu Thr Glu Glu Thr Val Asp Gln Leu Asp Glu Val
                165                 170                 175

Asn Gln Arg Ile Gly Glu Gly Val Glu Arg Val Glu Glu Ala Met Glu
            180                 185                 190

Thr Leu Gln Glu Ile Thr Asp Ala Val Glu Asp Ala Ala Ser Gly Met
        195                 200                 205

Gln Glu Val Ser Thr Ala Thr Asp Glu Gln Ala Val Ser Thr Glu Glu
    210                 215                 220

Val Ala Glu Met Val Asp Gly Val Asp Asp Arg Ala Gly Glu Ile Ala
225                 230                 235                 240

Ala Ala Leu Asp Asp Ile Ala Asp Ala Thr Asp Gln Gln Val Arg Thr
                245                 250                 255

Val Glu Glu Val Arg Glu Thr Val Gly Lys Leu Ser
            260                 265
```

<210> 81
<211> 235
<212> PRT
<213> Bacillus subtilis

<400> 81

```
Leu His Gln Lys Ile Gln Glu Thr Ser Gly Ser Ile Ala Asn Leu Phe
  1               5                  10                  15

Ser Glu Thr Ser Arg Ser Val Gln Glu Leu Val Asp Lys Ser Glu Gly
             20                  25                  30

Ile Ser Gln Ala Ser Lys Ala Gly Thr Val Thr Ser Ser Thr Val Glu
         35                  40                  45

Glu Lys Ser Ile Gly Gly Lys Lys Glu Leu Glu Val Gln Gln Lys Gln
     50                  55                  60

Met Asn Lys Ile Asp Thr Ser Leu Val Gln Ile Glu Lys Glu Met Val
 65                  70                  75                  80

Lys Leu Asp Glu Ile Ala Gln Gln Ile Glu Lys Ile Phe Gly Ile Val
             85                  90                  95

Thr Gly Ile Ala Glu Gln Thr Asn Leu Leu Ser Leu Asn Ala Ser Ile
            100                 105                 110

Glu Ser Ala Arg Ala Gly Glu His Gly Lys Gly Phe Ala Val Val Ala
        115                 120                 125

Asn Glu Val Arg Lys Leu Ser Glu Asp Thr Lys Lys Thr Val Ser Thr
    130                 135                 140

Val Ser Glu Leu Val Asn Asn Thr Asn Thr Gln Ile Asn Ile Val Ser
145                 150                 155                 160

Lys His Ile Lys Asp Val Asn Glu Leu Val Ser Glu Ser Lys Glu Lys
                165                 170                 175

Met Thr Gln Ile Asn Arg Leu Phe Asp Glu Ile Val His Ser Met Lys
            180                 185                 190

Ile Ser Lys Glu Gln Ser Gly Lys Ile Asp Val Asp Leu Gln Ala Phe
        195                 200                 205

Leu Gly Gly Leu Gln Glu Val Ser Arg Ala Val Ser His Val Ala Ala
    210                 215                 220
```

Ser Val Asp Ser Leu Val Ile Leu Thr Glu Glu
225 230 235

<210> 82
<211> 27
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Myoglobin
recognition sequence

<220>
<221> UNSURE
<222> (20)..(21)
<223> Xaa at positions 11, 20 and 21 is unknown

<400> 82
Gly Gln Asp Val Leu Val Val Leu Ile Lys Xaa His Pro Leu Ile Gln
1 5 10 15

Glu Lys Ile Xaa Xaa Phe Asp Phe Phe Lys His
20 25

<210> 83
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Myoglobin
recognition sequence

<220>
<221> UNSURE
<222> (4)..(12)
<223> Xaa at positions 4 and 12 is unknown

<400> 83
Ala Gln Arg Xaa Arg Leu Ala Gln Ile His Ala Xaa Lys Gly Lys Ile
1 5 10 15

Pro Asp Trp Tyr Leu
20

<210> 84
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Myoglobin
recognition sequence

<220>
<221> UNSURE
<222> (4)..(15)
<223> Xaa at positions 4, 10, 14 and 15 is unknown

<400> 84
Ile Ile Lys Xaa Thr Val Pro Val Leu Xaa Glu His Gly Xaa Xaa Ile
1 5 10 15

<210> 85
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Myoglobin
recognition sequence

<220>
<221> UNSURE
<222> (11)
<223> Xaa at position 11 is unknown

<400> 85
Gly Gln Asp Val Leu Val Val Leu Ile Lys Xaa Asn Pro Glu Ile Gln
1 5 10 15

Glu Lys Phe Phe Phe Phe Lys His
20

<210> 86
<211> 21
<212> PRT
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Myoglobin
recognition sequence

<220>
<221> UNSURE
<222> (4)..(12)
<223> Xaa at positions 4 and 12 is unknown

<400> 86
Ala Gln Arg Xaa Arg Leu Ala Gln Ile His Ala Xaa Lys Gly Lys Ile
1 5 10 15

Pro Asp Trp Tyr Leu
20